CLAIMS

1. An implantable medical apparatus for detecting diastolic heart failure, DHF, comprising a DHF determining device for determining at least one DHF parameter for detecting a DHF state of the heart of a patient, **characterized in** that said DHF determining device comprises a means (2, 4, 8, 10; 14, 20, 22, 24; 26, 30, 34, 36; 38) for determining, as said DHF parameter, the time length of a predetermined phase of diastole.

2. The apparatus according to claim 1, **characterized in** that comparison means are provided to compare said time length with predetermined upper and lower limit values for the detection of DHF.

3. The apparatus according to claims 1 or 2, **characterized in** that said DHF determining device comprises sensor and calculating means (2, 4, 8, 10; 14, 20, 22, 24; 26, 30, 34, 36; 38) for determining the time, DT, from the occurrence of peak blood flow velocity (E) through the mitral valve to zero blood flow velocity therethrough as said DHF parameter.

4. The apparatus according to claim 3, **characterized in** that said sensor and calculating means are adapted to determine DT by extrapolating the mitral blood flow velocity to zero, if zero velocity is not obtained before atrial contraction.

5. The apparatus according to claim 4, **characterized in** that said sensor and calculating means are adapted to determine the time derivative of the blood flow velocity through the mitral valve shortly after said peak blood flow velocity (E) for use for linearly extrapolating the blood flow velocity to zero.

6. The apparatus according to claim 1 or 2, **characterized in** that said DHF determining device comprises sensor and calculating means (2, 4, 8, 10; 14, 20, 22, 24; 26, 30, 34, 36; 38) for determining isovolumic relaxation time, IVRT, as said DHF parameter.

7. The apparatus according to any of the claims 3 - 6, **characterized in** that said sensor and calculating means comprise a means for measuring IEGM for determining DT and/or IVRT.

8. The apparatus according to any of the claims 3 - 6, **characterized in** that said sensor and calculating means comprise a means (2, 4, 6, 8, 10, 12; 14, 16, 18, 20, 22, 24; 26, 28, 30, 32, 34, 36) for measuring an impedance in the patient ´s heart for determining DT and/or IVRT.

9. The apparatus according to any of the claims 3 - 6, **characterized in** that said sensor and calculating means comprise a sound sensor (38) for determining DT and/or IVRT.

10. The apparatus according to any of the claims 3 - 6, **characterized in** that said sensor and calculating means comprise an accelerometer (38), intended to be placed on the left ventricle of the patient ´s heart, for determining DT and/or IVRT.

11. The apparatus according to any of the preceding claims, **characterized in** that said DHF determining device is adapted to determine said time length at predetermined time intervals and in that a storing means is provided for storing said determined time lengths.

12. The apparatus according to any of the claims 2 - 11, **characterized in** that said comparison means are connected to said storing means for storing said time length values above said upper limit and below said lower limit values together with the magnitudes of the deviations from corresponding limit values and the times of the occurrence of the deviated values.

13. The apparatus according to any of the claims 1 – 10, **characterized in** that said DHF determining device is adapted to determine changes in said time length and in that a storing means is provided for storing said determined changes in time length.

14. The apparatus according to any of the claims 2 – 10, **characterized in** that

an alerting means is provided to be triggered if deviation of the determined time length from said upper or lower limit values exceed a predetermined threshold value.

15. The apparatus according to claim 14, **characterized in** that said alerting means is adapted to be triggered if said time lengths exceed said upper or are below said lower limit for a time period of predetermined length.

16. The apparatus according to any of the claims 1 - 14, **characterized in** that an alerting means is provided to be triggered in response to the detection of a change in said determined time length exceeding a predetermined threshold value.

17 A pacemaker, **characterized in** that it comprises an apparatus according to any one of the preceding claims and control means for optimising pacing therapy and pacemaker settings depending on the determined time length.

18. A method of detecting diastolic heart failure, DHF, comprising the step of determining at least one DHF parameter for detecting a DHF state of the heart of a patient, **characterized in** that said step of determining at least one DHF parameter comprises determining, as said DHF parameter, the time length of a predetermined phase of diastole.

19. The method according to claim 18, **characterized in** that said DHF parameter is the time, DT, from the occurrence of peak blood flow velocity (E) through the mitral valve to zero blood flow velocity therethrough.

20. The method according to claim 19, **characterized in** that to determine DT the mitral blood flow velocity is extrapolated to zero, if zero velocity is not obtained before atrial contraction.

21. The method according to claim 20, **characterized in** that the time derivative of the blood flow velocity through the mitral valve shortly after said blood flow peak velocity (E) is determined for use for linearly extrapolating the blood flow velocity to zero.

22. The method according to claim 18, **characterized in** that said DHF parameter is the isovolymic relaxation time, IVRT,

23. The method according to any of the claims 19 – 22, **characterized in** that IEGM is measured for determining DT and/or IVRT.

24. The method according to any of the claims 19 – 23, **characterized in** that an impedance in the patient ´s heart is measured for determining DT and/or IVRT

25. The method according to any of the claims 18 – 24, **characterized in** that said time length is determined at predetermined time intervals and stored.

26. The method according to any of the claims 18 – 24, **characterized in** that changes in said time length are determined and stored.